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Department of Energy
Richland Operations Office
P.O. Box 550
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APR 24 1995

Mr. Steve M. Alexander
Perimeter Areas Section Manager
Nuclear Waste Program
State of Washington
Department of Ecology
1315 W. Fourth Avenue
Kennewick, Washington 99336-6018

Dear Mr. Alexander:

RESPONSE TO THE STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, COMMENTS OF MARCH 29, 1995, ON "IDENTIFICATION OF CONTAMINANTS OF CONCERN," PNL-10400, UC-630, DRAFT, JANUARY 1995 40040

Attached are the U.S. Department of Energy, Richland Operations Office, responses to the subject comments. If you want to discuss these comments, please contact Mr. Randy Brich at (509) 376-9031.

Sincerely,

Julie K. Erickson, Director
River Sites Restoration Division

RSD:RFB

Attachment

cc w/attach:
P. Eslinger, PNL
L. Gadbois, EPA
D. Holland, Ecology
R. Jim, YIN
B. Napier, PNL
D. Powaukee, NPT
J. Wilkinson, CTUIR
J. Yokel, Ecology

RESPONSE TO THE STATE OF WASHINGTON, DEPARTMENT OF ECOLOGY, COMMENTS OF MARCH 29, 1995, ON "IDENTIFICATION OF CONTAMINANTS OF CONCERN," PNL-10400, UC-630, DRAFT, JANUARY 1995

Responses to each of the following comments are provided below:

GENERAL COMMENTS

This document focuses on identifying contaminants of concern that are specific to the 100, 300, and 1100 areas within 500 feet of the river and diluted by the river by 1000 times (except near river soil and sediment dilution of 100 times). This approach is inadequate to address contaminant impact in the spring, seep and slack water areas of the Hanford Reach including contaminants near the Hanford townsite area. As an example to illustrate Ecologys concerns with the screening process: The near river well 399-2-1 sampled on 9-16-93 (DOE/RL-94-85) had a Gross Alpha concentration of 67.3 pCi/l. Plugging this value into the 4.2.1.1 and the 4.1.1 equations results in a value of 6.7 E-9. Thereby deleting this contaminant from the contaminants of concern list based on the 1E-6 screen. The 300 area spring 42-2 was sampled this fall at low river level and a value of 102.25 Pci/L was reported for Gross Alpha. Also a split from this same sample showed chronic toxicity in two indicator species with Gross Alpha being the major contaminant. From this example we have three concerns.

1.) The well concentration which is above the MCL did not survive the screen. It was assumed to be fully diluted and therefore not add to river risk.

2.) We know from spring sampling (Ecology fall 94) data that the same contamination (Gross Alpha) does reach the river in above ambient water quality criteria concentrations and with proven toxicity .

3.) We are concerned that chemicals which may have measureable toxicity at the area of the springs have been screened and thereby not make the contaminants of concern list.

Chemicals at the mouth of the springs could expose a human or ecological receptor for a longer time and at a higher concentration than is shown in the equations for estimation of contaminant concentrations in river water.

Response: **Accept. Screens will be developed to address concentrations in seeps and riparian zones before complete mixing in the river.**

SPECIFIC COMMENTS

1) Page vii, 4th paragraph
In order to be a comprehensive assessment, consideration must be given to potential impacts resulting from known vadose zone contaminants that are expected to reach the river at concentrations exceeding currently acceptable levels. Attempting to limit the assessment to only contaminants and contaminant levels currently in groundwater will have two detrimental effects. First, it will lose technical accuracy by ignoring relevant data. Secondly, it might be interpreted as an attempt by DOE to skew the results of this assessment ignoring data relevant to the river assessment but detrimental to DOE's public image.

Response: **Not accepted. The temporal scope of the CRCIA, as stated in TPA Change Number M-13-93-06, dated January 25, 1994, deals**

only with current and residual Hanford-derived contamination. However, in the interest of completeness, contaminants in the vadose zone near the river were included in the draft document (see Table A.2). Section 7.2 discusses sources of information for contaminants that may reach the river in the future. A qualitative statemment will be included to indicate whether the concentration level of the contaminants of concern identified in this report are expected to increase or decrease with time.

2) Page viii, Overall Comment
State how the screening methods handle chemicals that have no established toxicity values.(i.e.,no cancer slope factors, no RfD/RfC, no AWQC, no TLM or NOEC, no LC50)

Response: Accept. A description will be included.

3) Page viii, 2nd paragraph
For radionuclide screening inhalation and dermal exposure have been ignored. EPA RAGGS guidance identifies inhalation and dermal slope factors in IRIS and HEAST.

Response: Not accepted. The screens used were designed for ranking purposes rather than detailed pathways analysis. These exposure pathways generally contribute only a fraction of the dose received from ingestion (Strenge et al. 1994). Scenarios to be analyzed for the TPA Milestone will consider these and other exposure pathways.

4) Page viii, 3rd paragraph
(a) For carcinogenic chemical screening there is no account for inhalation and dermal exposure.
(b) Some carcinogens don't have slope factors. How do you examine data without toxicity factors?

Response: (a) Not accepted. See response to comment 3.
(b) Accepted. See response to comment 2.

5) Page viii, paragraphs 2 and 3
It appears that the biotic pathway of crop ingestion has been overlooked in the radionuclide and carcinogenic chemical screening. While this pathway is not critical for many contaminants, it is the primary pathway for incremental cancer risks (ICR) for several contaminants. Please note the following comparison of pathways for ICR contributions of these selected contaminants (DOE 1994).

Contaminant	Percent Contribution of Pathway to ICR					
	water	soil	sediment	fish	crop	External Surface
	ingest	ingestion	ingestion	ingest	expo	ingestion
C-14	0.02%	<0.01%	<0.01%	49.20%	<0.01%	<0.01%
K-40	0.07%	<0.01%	<0.01%	16.58%	<0.01%	<0.01%
Ni-63	1.44%	0.03%	<0.01%	38.20%	<0.01%	<0.01%
Sr-90	0.62%	<0.01%	<0.01%	68.33%	<0.01%	<0.01%
Arclor 1260	15.42%	0.29%	0.05%	32.85%	<0.01%	<0.01%
Benzo(a)pyrene	12.44%	0.23%	<0.01%	70.96%	<0.01%	<0.01%
Chrysene	5.23%	0.10%	<0.01%	54.32%	<0.01%	<0.01%

It is recommended that you include some type of a crop ingestion pathway for the above (and any other) contaminants known to have an affinity for plant uptake.

Response: Accept.

6) Page viii, 4th paragraph
The inhalation RfC has been neglected.

Response: Not accepted. See response to comment 3.

7) Page viii, 5th paragraph
What can be used if a chemical doesn't have an ambient water quality criteria?

Response: Acknowledged. Several independent screens are used to ensure that important contaminants are not missed because of lack of some parameters.

8) Page viii, 6th paragraph
What is the reference for the one percent of the LC50?

Response: Accept. This was an assumption; an explanation will be provided in the body of the text.

9) Page viii, 7th paragraph
Define background more completely. Is this background with or without anthropogenic input. Chemicals below natural background may still have toxicological significance.

Response: Acknowledged. A series of references for background levels are provided in Appendix A. Concentrations of materials at or below background levels cannot be attributed to Hanford operations.

10) Page viii, last paragraph
The nonhazardous screening eliminated the contaminats listed based on human health screening. These compounds should not be eliminated since they could pose a risk to ecological systems.

Response: Accept. These contaminants will be used in the ecological screens.

11) Page ix, 1st paragraph
The rationale for requiring a river concentration value for all screening formulas is absent. To develop surrogate concentration values might be appropriate if one focused only on the river downstream from McNary. This approach fails to evaluate localized impacts and risks associated with contaminated groundwater, seep, or spring discharge or any exposed sediments. The localized risks must also be addressed.

Response: Accepted. See response to the general comment.

12) Page ix, 3rd paragraph
Kds could be used.(Refer to comment #30)

Response: **Not accepted. The current approach can be used when data are not available in both media. Sorption data are not available for most of the several hundred contaminants identified. The value is conservative for water to sediment transfers. Routine surveillance has analyzed ambient river water for the EPA priority pollutant list. Those contaminants not detected are given surrogate values in this screen. While it may not be conservative for sediment to water transfers, available data on measured water concentrations imply that the soption values are quite high.**

13) Page x
Why is a specific salt of silver listed rather than a generic silver as with other metals? Is this meant to exclude other silver compounds? This would be inappropriate, since silver nitrate and silver sulfate can be highly toxic to aquatic organisms (EPA, 1995)

Response: **Acknowledged. Silver nitrate was the only silver compound identified. It is associated with a particular known source.**

14) Page xi, 3rd paragraph
Too many assumptions in this paragraph. Conclusions related to the source of these chemicals would be better dealt within another document. The preface states that this document is for identification purposes only.

Response: **Not accepted. The intent is to point out to the reader that the contaminants found are reasonable given the history of Hanford operations.**

15) Page xiv
Hazard quotient should be listed and defined.

Response: **Not accepted. The term hazard quotient is not used in the report.**

16) Page xv
Modify the reference dose definition to include applicability to noncarcinogenic effects. The reference dose is also usually defined a dose without subchronic or chronic deleterius effects. The definition for "slope factor " derived from animal models should include the 95% UCL mention of upper probability. However slope factors derived from human dose-response data are generally based on the best estimate (i.e. medium or 50th percintile values) which is the case for radionuclides.

Response: **Accepted. The definitions will be revised.**

17) Page 1.1 section 1.0
In addition to current risk (which is the primary focus of this study) this assessment is intended to take a qualitative look at risk associated with potential and/or anticipated contaminant plumes as they migrate to the river.

Response: **Not accepted. See the response to comment 1.**

18) Page 1.4, section 1.3, 3rd paragraph

Again consideration must be given to contaminants in known concentrations in the vadose zone. In the contaminated soils beneath the 216-B cribs uranium is the primary contaminant of concern. While uranium has already been transported to the groundwater at low concentrations, the future concentration of total uranium could realistically exceed 3000 pCi/L and in a more conservative scenario, exceed 8000 pCi/L (DOE 1994b). This type of information cannot be ignored.

Response: Not accepted. See the response to comment 1.

19) Page 3.1, section 3.2, paragraph 3
Global fallout is attributed as the source for "Many of the analytes...." If you have a reference, then please state it. If it is an unsubstantiated assumption, then please delete this statement.

Response: Acknowledged. A series of references for background levels are provided in Appendix A. Concentrations of materials at or below background levels cannot be attributed to Hanford operations.

20) Pages 3.3-3.6, Tables 3.1 and 3.2
The addition of a column listing background concentrations would be helpful and informative.

Response: Acknowledged. The values are already provided in Appendix A.

21) Page 4.1, 2nd paragraph
Ecology concurs with the fish consumption rate used from the CRITFC even though the rate utilized exceeds the average 90th percentile (140 g\day) for the U.S. population. (EPA 1990) It may be appropriate for the Tribal use scenario.

Response: Acknowledged.

22) Page 4.1, 3rd paragraph
Define " fraction". Do you mean the one percent of the LC50?

Response: Acknowledged. See section 4.1.5 for details.

23) Page 4.2, section 4.1.1
(a) If my logic is correct the radionuclide screening equation results in the units of "Risk per Year". Should this value be multiplied by a lifetime value of seventy years to yield units of "risk"? The concern level of 1E-6 risk would then be appropriate. Otherwise the concern level may be as high as 7E-5 risk over 70 years. Units for all parameters should be shown.

(b) The radionuclide screen does not consider the effects of ionizing radiation on aquatic and terrestial organisma assoxciated with the river ecosystem (e.g., NCRP, 1991,IAEA,1992) Radiological effects are ignored in this equation. Page 4-17 of HSRAM Rev. 3 addresses this issue.

(c) Another omission is noncarcinogenic effects of radionuclides.

(d) The low value of 10mg/day for sediment consumption needs to be explained in light of the EPA soil ingestion value of 200 mg/day.

(e) Inhalation of radionuclides was not considered even though inhalation slope factors are available for some radionuclides. Similarly dermal contact was not considered.

Response: **(a) Accepted. Text will be modified to clarify the units of the screen are annual risk.**
(b) Not accepted. References cited all indicate an acceptable level of biotic risk at 1 rad/day. None of the concentrations in this document approach that value.
(c) Not accepted. Nonstochastic effects are not expected at the concentrations found.
(d) Acknowledged. The scenario analyzed is not the one you reference (apparently from the HSRAM). In general, the HSRAM methodology is not appropriate for this assessment.
(e) Not accepted. See response to comment 3.

24) Page 4.2, section 4.1.2
Inhalation of chemical carcinogens was not considered. It is possible that these substances could be inhaled as volatiles or particles of dust.

Response: Not accepted. See response to comment 3.

25) Page 4.2, Last Sentence
What does "approach" mean? Do you round off values? Any confidence limits used? EPA guidance recommends 10E-7 for screening to conservatively handle additive, synergistic, multiplicative effects, etc.

Response: Not accepted. Approach means numbers of approximately the same magnitude. In general, the HSRAM methodology is not appropriate for this assessment.

26) Page 4.3, section 4.1.3

(a) It would be helpful to list units of the screen values.

(b) Utilize the standard terminology "hazard quotient" for noncarcinogen chemical screening.

(c) Again present rationale as to why inhalation and dermal contact pathways were not included for noncarcinogens.

(d) Reference concentrations (RfC) are available for some noncarcinogens.
(e) Regarding the screening ratio of concern for noncarcinogens, it might be appropriate to be more conservative (e.g. ratio=0.1) since chemical interactions are not taken into consideration.

Response: **(a) Not accepted. Units of the screen are either risk (dimensionless) or dimensionless.**
(b) Not accepted. The term screen better defines the concept presented.
(c) Not accepted. See response to comment 3.
(d) Acknowledged.
(e) Not accepted. See section 4.3; the value of 0.1 was used.

27) Page 4.3, section 4.1.4
(a) The measured or surrogate water concentration should be in ug/L not pCi/L. This must be a typo.

(b) As mentioned previously it might be more appropriate to use the screening ratio of 0.1 to consider chemical interactions.
(c) Again, effects of radionuclides on aquatic organisms are not considered, furthermore, terrestrial organisms are completely ignored in the ecological screens.

Response: (a) Accepted.
(b) Not accepted. See response to comment 26 (e).
(c) Accepted. See response to the general comment.

28) Page 4.4, section 4.1.5

(a) With aquatic biota toxicity screening, use the standard terminology "no observed effect concentration" (NOEC), rather than "threshold limit" (TLM). Note that any effect may not necessarily be adverse (e.g., Ah receptor binding and activation of the CYP1A1 gene with dioxin), so that the "no observed adverse effect concentration" (NOAEC) might be preferred. There are also statistical problems with the NOEC in that this concentration is a function of concentrations selected in the experimental design (Suter, 1993; Noppert et al, 1994; EPA, 1989).

(b) LD50 should be LC50 and PCi/L should be ug/L.

(c) The equation contradicts what was stated in the previous paragraph by looking at the acute (LC50) effects first then the chronic (TLM). If there is a NOEL available screen first with it.

(d) Literature is available on the impact of chemical and radionuclide contaminants on fish eggs. (e.g., Friant and Brandt, 1994; Woodhead, 1970; McKim, 1985; Weis and Weis, 1991)

Response: (a) Acknowledged. We will verify with the reference.
(b) Accepted.
(c) Not accepted. Order of presentation in the screen is inconsequential.
(d) Accepted. The references are appreciated.

29) Page 4.5, section 4.2.1.1, 1st paragraph
This surrogate value limits the usability of this screen to below McNary Dam. It eliminates localized exposure from consideration. Contaminants which might pose a risk associated with an individual collecting roots and berries and drinking from the springs would be eliminated from consideration. This would especially be true if it were a contaminant whose primary risk pathway were vegetative.

Response: Accepted. See response to the general comment.

30) Page 4.5, last sentence
The equilibrium partition coefficient (1E=5 for sediment/river water partitioning) assumed is arbitrary and could lead to large errors for estimating sediment and river water distributions. Nonionic organic chemicals in sediment interstitial water are in equilibrium with concentrations in sediment therefore chemical specific partition coefficients should be used if available. Partition coefficients are reported in the literature as organic carbon partitiion coefficients(Koc) and as octanol\water partition coefficients (Kow). Kow can be related to Koc by an empirical regression equation and Koc then multiplied by the

sediment fraction organic carbon (foc) to yield a sediment /interstitial water partition coefficient (Kd). Because free water in the water column will be diluted, chemical concentrations in river water will be lower than those in interstitial water. Therefore, using chemical specific Kd to estimate chemical concentrations in the river water from chemical concentrations in the river sediment is a conservative approach.
Loosely bound is not always the most conservative approach. Loosely bound would enable a chemical to be more bioavailable.
Another factor to consider regarding sediment toxicity screening is the presence of acid volatile sulfide (AVS) which has been shown to reduce metal bioavailability and reduce toxicity. (Suter, 1993)

Response: Not accepted. See response to comment 12.

31) Page 4.6, first paragraph
Give more rationale for the 1% contaminated surface area estimate on the Hanford Site.

Response: Not accepted. The value of 1% is conservative.

32) Page 4.7, near river soil equation
(a) For near river soil, Csoil should have units of ug/kg rather than pCi/g.
(b) The assumption of soil/groundwater equivalency is not correct for all chemicals. One example would be hexavalent chromium which prefers to concentrate in the groundwater.

Response: (a) Accepted.
(b) Not accepted. The approach utilized was conservative.

33) Page 7.2
The nitrate drinking water standard is 10mg/L. The 45mg/L MCL is expressed as nitrate plus nitrite-nitrogen.

Response: Not accepted. WAC 248-54 gives the value 45.

34) Page 7.3
In the first paragraph the reference made to "table 3.3" should be "Appendix A" instead.

Response: Not accepted. Table 3.3 is identical to Table A.3.

35) Page 9.1
The use of the word "consistent" as applied to screening results seems inappropriate in that every identified compound was not identified by all screens. Compounds identified by multiple screens are compounds exerting multiple toxic effects.

Response: Not accepted. The results were consistent in that screens for different purposes still identified the same compounds. The results were not expected to be identical.

36) Page 9.1, first paragraph
Screening contaminants within 500 feet of the river could delete large portions of the unconfined aquifer. The interaction of the river from high to low flows could free chemicals from soils in the vadose zone. In the 300 area the unconfined aquifer reaches to within a quarter of a mile

of the river bank. The 500 foot value is too conservative of a value for the entire Hanford Reach.

Response: Accepted in part. The data compiled were from near-river operable units or from the site within 500 ft of the river. Text will be added to clarify this aspect of the data selection process.

37) Page B.1
The definition of LC50/100 is incorrect. LC50/100 is 1% for the medium lethal concentration.

Response: Not accepted. The value in the table is the LC50. When used in the equation it is divided by 100.

38) Page B.2
The units for external slope factor are incorrect. They should read risk/yr per pCi/g soil throughout all the tables.

Response: Accepted. Typographical error will be corrected.

39) Page B.3
Information on specific compounds tested in bioassays should be explained. This information qualifies the LC50 and TLM data in that these data may differ for different compounds containing the same analyte of interest (e.g., vanadium as vanadium pentoxide vs. vanadium trioxide).

Response: Accepted. Text will be added.

40) Page C.2-C.8
A number of chemicals appear to exceed the screening thresholds and do not have disqualifying criteria yet do not appear as contaminants of concern in the appropriate media-specific tables.
These include: *surface water* strontium -90, uranium- 234, uranium-238, *groundwater* arsenic, beryllium, cadmium, carbon-14, dichloroethylene, methylene chloride, ruthenium-106, thorium- 228, *sediment* beryllium, *soil* europium-155,plutonium -235, strontium-90,zirconium-95, benzoanthracene, benzofluoranthene, beryllium, bis [2-ethylhexyl]pthalate, cadmium, chrysene.
Several of the chemicals are not in the proper column of the media specific tables . For example, sediment arsenic should be in the carcinogenic column and not the hazard index column of table 4.3, soil chlordane should be in the carcinogenic column and not in the hazard index column of table 4.4. Similarly, many of these contaminants of concern also do not appear in the first column of contaminant summary Tables S.1 nor 9.1 (uranium-234, uranium-238, beryllium, cadmium, carbon-14, dichloroethylene [1,2-trans], methylene chloride, ruthenium-106+D, thorium-228, europium-155, plutonium-239, zirconium-95, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, bis[2-ethylhexyl]phthalate, chrysene).

I also noticed that several chemicals are not in the appropriate column of the media-specific tables (e.g., sediment arsenic should be in carcinogenic chemical screening column and not in the hazard index screening column of Table 4.3, soil chlordane should be in carcinogenic column and not in the hazard index column of Table 4.4, etc.).
As far as contaminants in groundwater away from the river, Table C.3 indicates that arsenic, cesium-137, cobalt-60, and strontium-90 exceed

the carcinogenic/radionuclide screening thresholds, yet these contaminants do not appear in the second column of summary Tables S.1 and 9.1. They should be labeled with footnote "d" in the first column of these tables to indicate that they are contaminants of concern in groundwater away from the river.

It appears that a careful check of all data screening summaries is needed.

Response: Accepted. A careful check of all data screening summaries will be performed.

References

DOE 1994, Remedial Investigation/Feasibility Report for the 300-ff-5 Operable Unit, DOE/RL-94-85, Draft A, USDOE, Richland, Wa.

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